

Claims

1. A method for magnetically recording information in a magnetic recording medium that includes a magnetic recording layer:

5 placing a write head in proximity to the magnetic recording medium;
 lowering a longitudinal coercivity in a magnetic domain in the magnetic recording layer by generating a vertical component of magnetic flux in the magnetic recording medium using the write head, the vertical component extending from the write head to a magnetically soft underlayer disposed under
10 the magnetic recording layer; and
 writing a longitudinal orientation in the magnetic domain in the magnetic recording layer by generating a horizontal component of magnetic flux in the magnetic recording layer using the write head.

15 2. The method of claim 1 wherein the step of lowering a longitudinal coercivity further comprises using a magnetically soft underlayer, that is located under the magnetic recording layer and separated from the magnetic recording layer by a spacer layer, to guide the magnetic flux through the magnetic recording layer at an angle having a vertical component and a horizontal component with the vertical component being smaller than the horizontal component.

20 3. The method of claim 2 further comprising magnetically saturating the magnetically soft underlayer after lowering the longitudinal coercivity.

25 4. The method of claim 2 wherein the magnetically soft underlayer is NiFe.

5. A method for magnetically recording information in a magnetic recording medium that includes a magnetic recording layer:
 - 10 placing a write head in proximity to the magnetic recording medium;
 - 15 generating magnetic flux in the magnetic recording medium using the write head;
 - 20 guiding the magnetic flux through the magnetic recording layer at an angle having a vertical component and a horizontal component with the vertical component being smaller than the horizontal component, the vertical component lowering a dynamic coercivity of a selected region of the magnetic recording layer and the horizontal component writing a longitudinal orientation in the selected region.
6. The method of claim 5 wherein the step of guiding the magnetic flux through the magnetic recording medium uses a magnetically soft underlayer located under the magnetic recording medium and separated from the magnetic recording medium by a spacer layer.
7. The method of claim 6 further comprising saturating the magnetically soft underlayer before the horizontal component writes the longitudinal orientation in the selected region.
8. The method of claim 6 wherein the magnetically soft underlayer is NiFe.

9. A thin film magnetic recording medium for use with a longitudinal write head comprising:

15 a magnetic recording layer for longitudinal recording with an easy axis of magnetization in the plane of the layer;

5 a non-magnetic spacer layer;

10 a magnetically soft underlayer and

10 wherein a thickness of the magnetically soft underlayer and a thickness of the non-magnetic spacer layer are designed to guide magnetic flux from the longitudinal write head through the magnetic recording layer at an angle having a vertical component and a horizontal component with the horizontal component being larger than the vertical component.

15 10. The thin film magnetic recording medium of claim 9 wherein the magnetically soft underlayer is designed to saturate before a maximum flux from the longitudinal write head is reached.

20 11. The thin film magnetic recording medium of claim 9 wherein the magnetically soft underlayer further comprises first and second soft magnetic layers separated by a non-magnetic spacer layer selected to achieve the antiferromagnetic coupling between the first and second soft magnetic layers.

25 12. The thin film magnetic recording medium of claim 9 wherein the magnetically soft underlayer is NiFe.

13. The thin film magnetic recording medium of claim 9 wherein the magnetically soft underlayer is from 1 to 100 nm thick.

14. A disk drive system comprising:
a longitudinal write head;
means for positioning the longitudinal write head in proximity with selected locations on a disk; and

5 a magnetic thin film magnetic recording medium on the disk including a magnetic recording layer for longitudinal recording with an easy axis of magnetization in the plane of the layer, a non-magnetic spacer layer, a magnetically soft underlayer and wherein a thickness of the magnetically soft underlayer and a thickness of the non-magnetic spacer layer are designed to
10 guide magnetic flux from the longitudinal write head through the magnetic recording layer at an angle having a vertical component and a horizontal component with the horizontal component being larger than the vertical component.

15 15. The disk drive system of claim 14 wherein the magnetically soft underlayer saturates before a maximum flux from the longitudinal write head is reached.

16. The disk drive system of claim 14 wherein the magnetically soft
20 underlayer further comprises first and second soft magnetic layers separated by a non-magnetic spacer layer with the first and second soft magnetic layers being antiferromagnetically coupled.

17. The disk drive system of claim 14 wherein the magnetically soft
25 underlayer is NiFe.

18. The disk drive system of claim 14 wherein the magnetically soft underlayer is from 1 to 100 nm thick.